CEM Solutions



E1/T1 PRI Gateway

User Manual

User Manual

PRI GATEWAY

Version 2.0

Contents

1. Product introduction

1.1. Overview

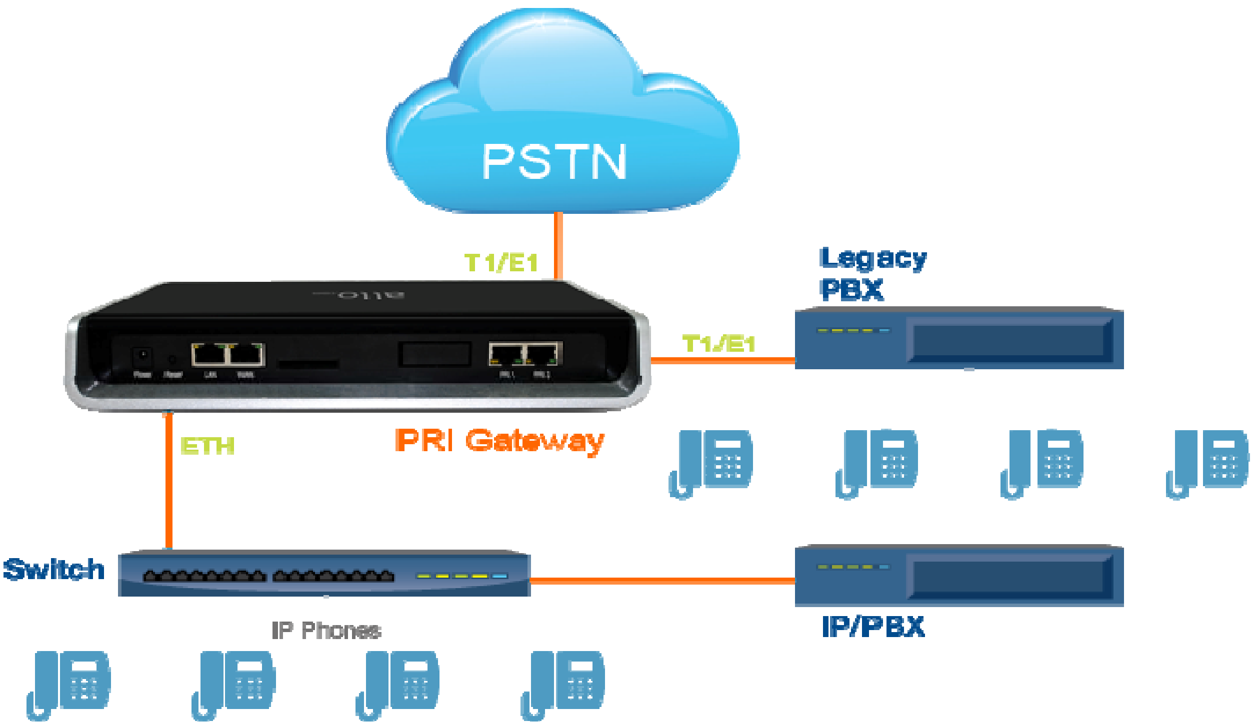
PRIGW100/200 is a PRI gateway aimed to target at small and medium offices and operators, and used to help enterprise to realize the evolution from the traditional PBX to voice IP. On the one hand, it supports PRI protocol and adopts standard T1/E1 trunk interface to realize docking with traditional PBX. On the other hand, adopt standard SIP protocol docking with various soft switches to ensure PSTN seamless access to IP voice network, and achieving VoIP. PRIGW100 supports intelligent multiple trunk routing technology, makes the operator easy to manage trunk routing by price optimum rule, and the automatic switch-over between multiple trunk routing makes the network have high reliability.

PRIGW100/200 has good call processing ability, and provides one or two T1/E1 interface. It is able to handle a variety voice decoding. It supports the rich GUI configuration, the user can easily set and maintenance the system. Mainly includes the following kinds of models:

PRIGW100-1E1 – 1 Span

PRIGW200-2E1 – 2 Spans

A typical network diagram shows the function of PRIGW100 as below.



1.2. Equipment Structure

1.2.1. Rear View



Interface	Description
Power	Connect the power adapter, 12VDC, 3.5A
PRI 1 & PRI 2	E1/T1 ports with line link LED indicators (Blue: Line normal)
WAN	Standard 10/100BASE-TX Ethernet Interface for WAN
Management Console (LAN)	Standard 10/100BASE-TX Ethernet Interface for LAN. Default Web GUI Login IP address is 192.168.113.2
Reset	Reset button for factory default.

1.2.2. Front View



PRI Gateway Front Panel LED Indicators:

LED 8	LED 7	LED 2	WAN	LAN	Power
Blue On- PRI 1 link is up (No Alarm)	Blue On- PRI 2 link is up (No Alarm)	Blue On- System Ready Blue Blink- Factory Reset	Orange Blinks- WAN link is up.	Orange Blinks- LAN link is up.	Orange On- Power is on.

1.3. Function and Feature

1.3.1. Protocol Standard Supported

- Standard SIP V2 protocol
- E1/T1 PRI protocol
- NAT Traversing (STUN)
- Hypertext Transfer Protocol (HTTP)

- Domain Name System (DNS) & Dynamic host configuration protocol (DHCP)
- ITU-T G.711A-Law/U-Law, G.729AB, G.722

1.3.2. System Function

- Echo Cancellation: Up to 128msec echo tail length
- DTMF mode: RFC 2833, SIP INFO and INBAND
- Digit manipulation
- Integrated SIP registrar
- Early Media Support
- STUN support
- Call Detail Records (CDR)
- HTTP configuration
- Firmware upgrade by Web

1.3.3. General Hardware Specification

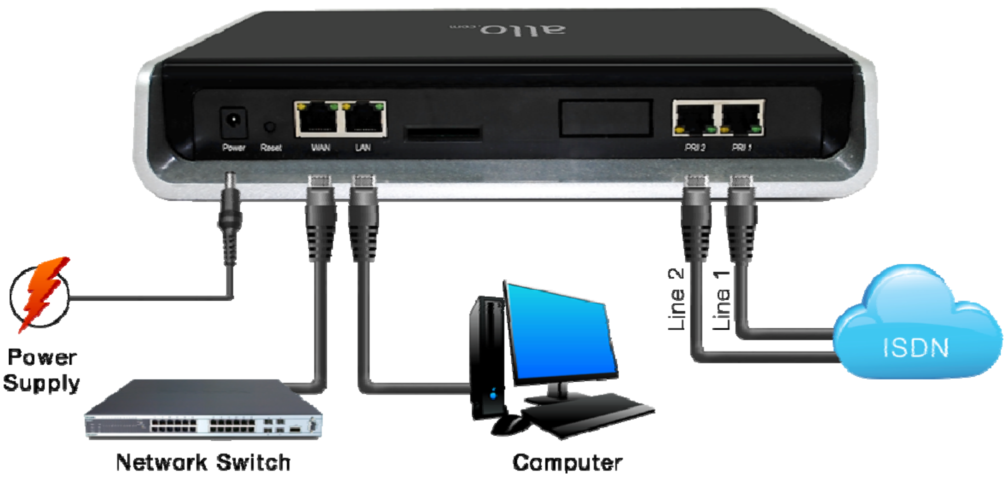
- Power supply: 12VDC, 3.5A
- Temperature: 0~40 deg(operational),-20~70 deg(storage)
- Humidity: 10%~90%, no condensation
- Max power consumption: 25W
- Dimension (mm): 250mm (W) x 220mm (L) x 43mm(H)
- Net Weight: 1.4 kg

WARRANTY

If the PRI Gateway was purchased from a Distributor/reseller, please contact the company where the device was purchased for replacement, repair or refund. If the device was purchased directly from **CEM-Solutions.net**, contact our Technical Support Team for a RMA (Return Materials Authorization) number before the product is returned. CEM-Solutions reserves the right to remedy warranty policy without prior notification.

⚠ **Warning:** Use the power adapter provided with the CEM PRI Gateway. Do not use a different power adapter as this may damage the device. This type of damage is not covered under warranty.

2. Getting started with PRI Gateway



2.1. Hardware Installation

Step 1: Plug one end of the RJ45 Ethernet cable into your Router & other end into the WAN port of the PRI Gateway.

Note: Use Straight-through Ethernet cable to connect between the unit & Router/Switch

Step 2: Plug one end of the RJ45 cable into the PRI 1 port of the PRI Gateway & other end to the E1/T1 service provider socket.

Step 3: Insert the Power Adaptor output connector into the "Power" port of the PRI Gateway & Plug in the Power Adapter to any available AC power outlet.

Step 4: The PRI Gateway will power up, and automatically connect itself to your network via DHCP (which you can later configure in the SETTINGS > Network Settings section)

Note: Wait until the unit is completely booted up and make sure that LED2 is green

PRI Gateway Front Panel LED Indicators:

LED 8	LED 7	LED 2	WAN	LAN	Power
Blue On- PRI 1 link is up (No Alarm)	Blue On- PRI 2 link is up (No Alarm)	Blue On- System Ready Blue Blink- Factory Reset	Orange Blinks- WAN link is up.	Orange Blinks- LAN link is up.	Orange On- Power is on.

2.2. Accessing the WEB GUI

PRI Gateway WEB GUI can be accessed either through WAN or Management Console. Steps to Access the GUI during the initial setup through Management Interface (LAN):

Step 1: Make the setup as described in Hardware setup section, Lets access the WebGUI through Management Interface (LAN)

Step 2: Change the Network setting of the PC in manual mode (i.e. Static IP mode). Assign the IP address to the PC in the range of 192.168.113.xxx (E.g:192.168.113.10), net mask as 255.255.255.0 and gateway & DNS as 192.168.113.1.

Step 3: Launch the web browser and enter the URL http://192.168.113.2 (Default LAN IP address) to open the login page of PRI Gateway's Graphical Interface.



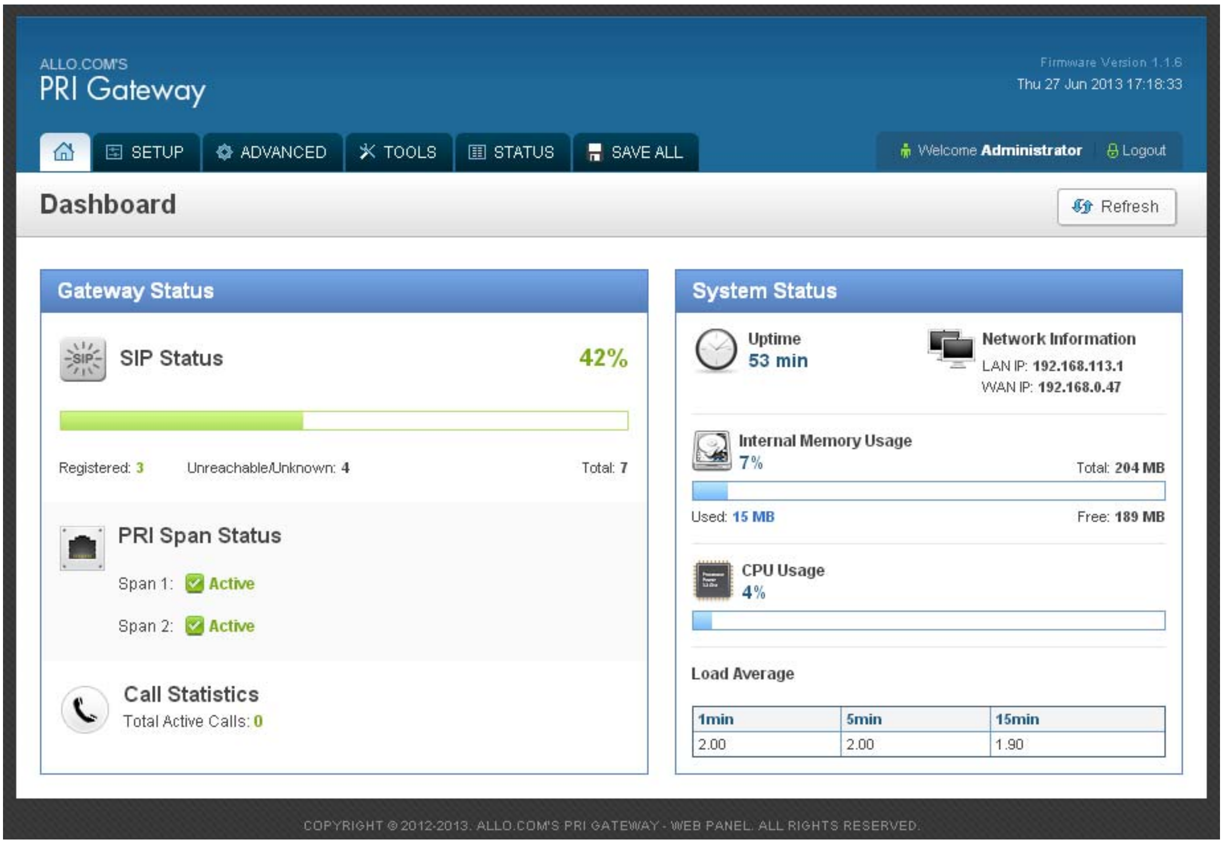
Step 4: Login using the default username & password (Default: Username: admin; Password: admin). Successful login takes you to the Dashboard page. Observe the WAN IP address on the dashboard, this will be used to access the GUI from the WAN interface.

Note: Recommended web browser to access GUI is Mozilla Firefox.

Step 5: If your network is not enabled with DHCP server, configure the WAN port IP address manually in the **SETTINGS > Network Settings** section as per your requirement.

3. Setting Up Features

3.1 System Dash Board



3.3 SIP Trunks

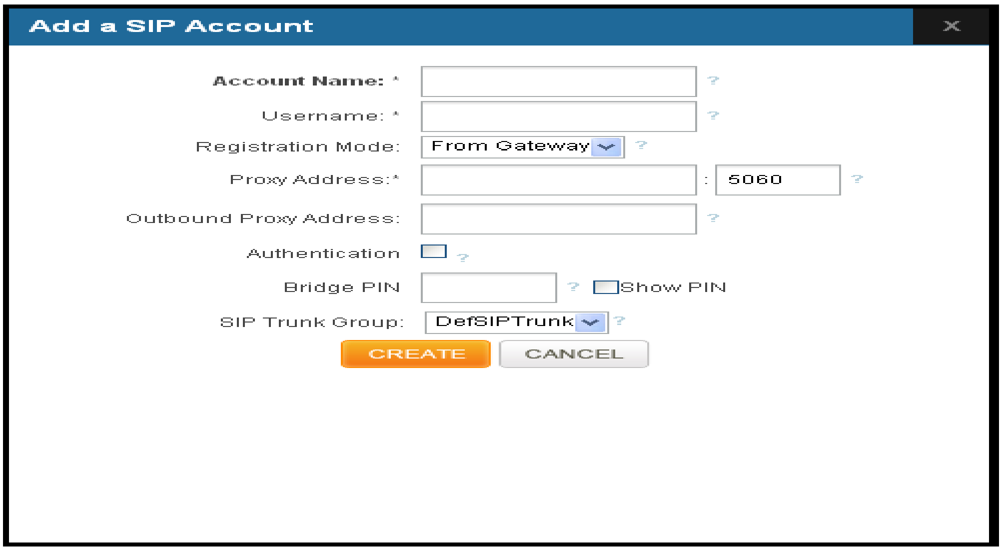
3.3.1 Add a SIP Trunk

Navigation: **SETUP > SIP Trunk > Add a SIP Trunk**: This is where you setup your SIP Trunks

1) Click Add SIP Trunk
2) Create a SIP user account for below registration methods.
3) Registration Mode:
    - None: IP peer trunking
    - From Gateway: Gateway is registering to PBX or VoIP service provider

- To Gateway: Endpoint registering to G/W

4) Enter the PBX or VoIP service provider IP address for registration mode " From Gateway or None"
5) Click authentication, if it is required
6) Click registration and add registrar address
7) Create and Save All.



Important Note:

Make sure to click the **SAVE ALL** button in the top navigation bar, after adding / editing / deleting any Extension. The **SAVE ALL** tab turns Orange if some changes are made and not saved.

3.3.2 Add SIP Trunk Group

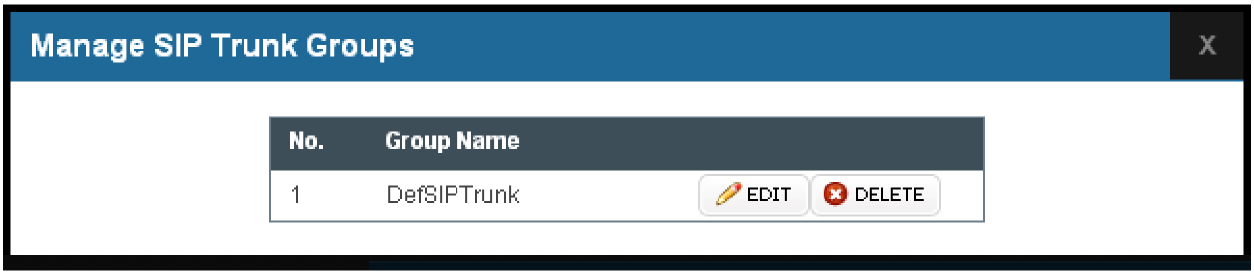
You can enable/disable Features like NAT and set the DTMF method.You can also configure various Codec's and can also prioritize the active Codecs using the up and down arrows.



3.3.3 Manage SIP Trunk Group

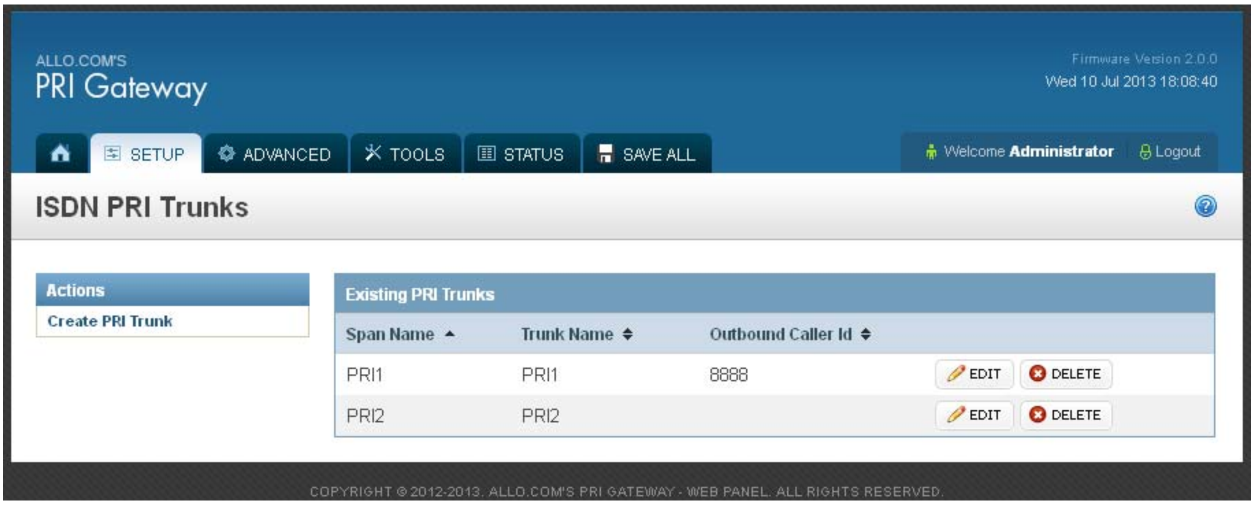
Administrator can edit or delete the Extension group in this configuration page.

Click on **“Save “**button if you have edited the Extension groups, followed by **“Save all”** button to update the configuration changes.

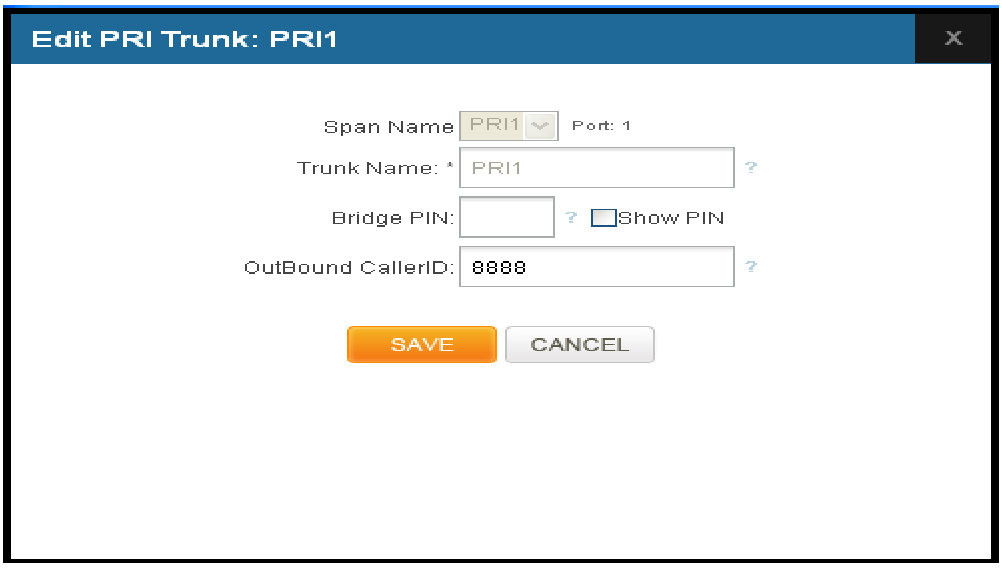


3.4 ISDN PRI Trunks

This will allow you to make calls using your PRI line.



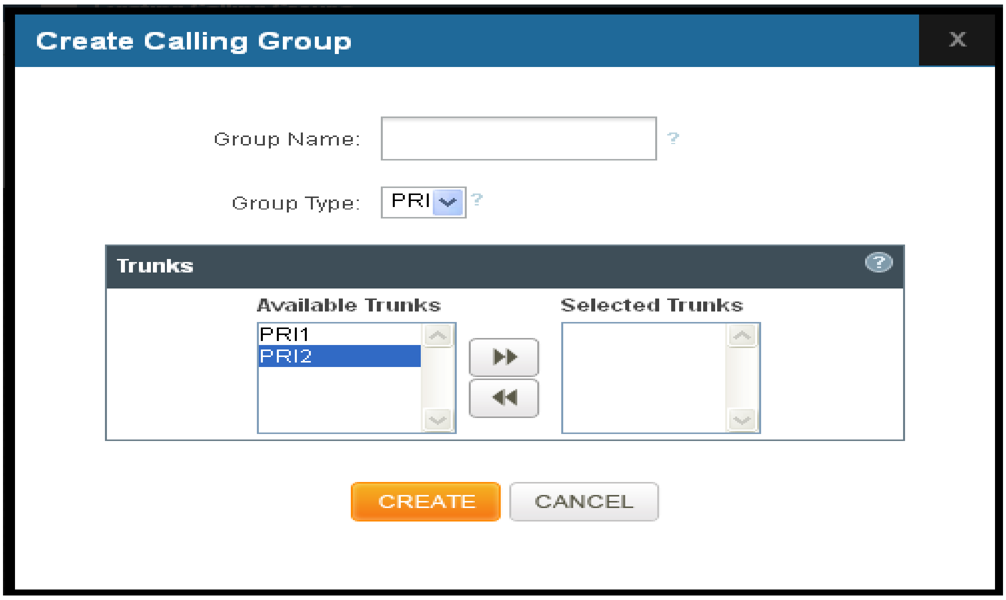
1. Connect your ISDN PRI line to the 1st/ 2nd port of the PRI Gateway
2. Click on the **SETUP >> ISDN PRI Trunks** link in the GUI, then select **Create PRI Trunks**
3. Enter Name your Trunk (Office Line 1 for example), Outbound Caller ID



Click on “**CREATE”,** followed by “**Save All**” button to update the configuration changes

3.5 Calling Groups

Navigation: **SETUP > Calling Groups**: This is where you setup your Trunk Calling groups You can create the Calling groups by selecting available trunks with two types : PRI trunk groups and SIP trunk groups.



3.6 Call Routing Rules

Depending on the number you dial, the PRI gateway will select the configured PRI/SIP Trunk.

1. Click Add Call Routing Rule

2. Add incoming or outgoing rules for PRI and SIP

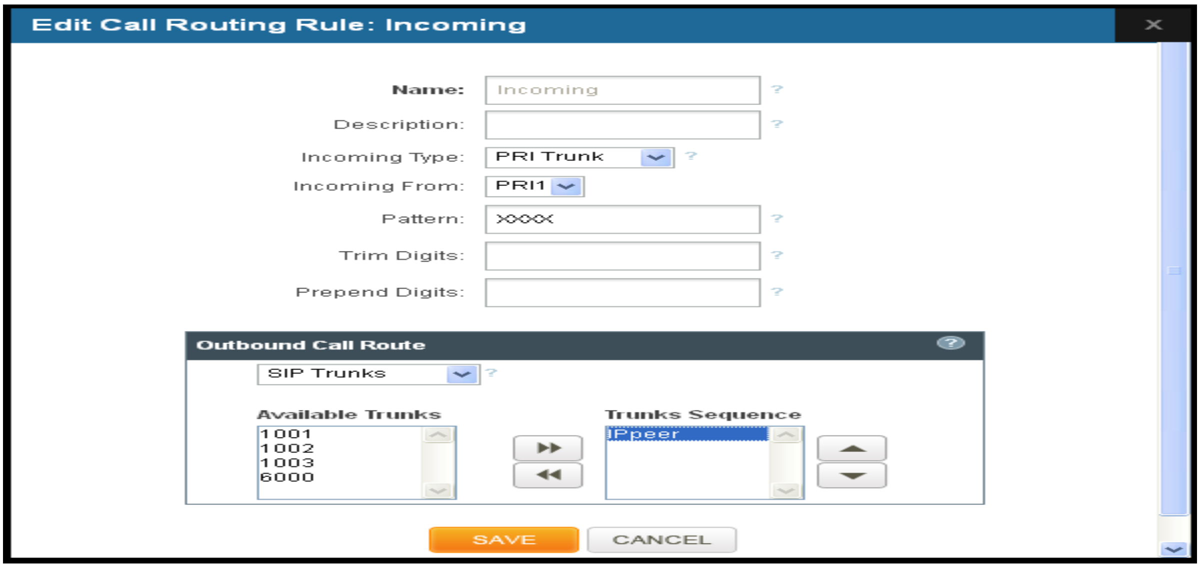
3. Select proper "Incoming type" and proper trunk name "Incoming from"

4. **Dial Pattern**:
X matches any digit from 0-9
Z matches any digit from 1-9
N matches any digit from 2-9
[1237-9] matches any digit or letter in the brackets
(in this example, 1, 2, 3, 7, 8, 9)
[a-z] matches any lower case letter
[A-Z] matches any UPPER case letter
. Wildcard, matches one or more characters
! Wildcard matches zero or more characters immediately.

5. **Trim Digits**: Allows the user to specify the number of digits that will be stripped from the dialed number. For Ex: If you configure the pattern as 9X. And you want to strip 9 then you should mention Trim Digits field as 1

6. **Prepend Digits**: Allows the user to specify the digits which are prepended before placing the call via trunk. Ex: If dialed number is 8789763010 and if you want to prepend 44 as a country code then mention in prepend digits field as 44

7. Outbound Call Route: Select proper SIP trunk or PRI trunk or Time route Group, where the destinations calls are going. And Move particular trunks form "Available Trunk" table to "Trunk Sequence" table"



3.7 Time of Day Routing:

3.7.1 Add a New Time Based Routing Rule:

By clicking on the **SETUP > Time of Day Routing > Add a New Time Based Routing Rule link** on the left-hand side PRI Gateway menu, we reach this section:

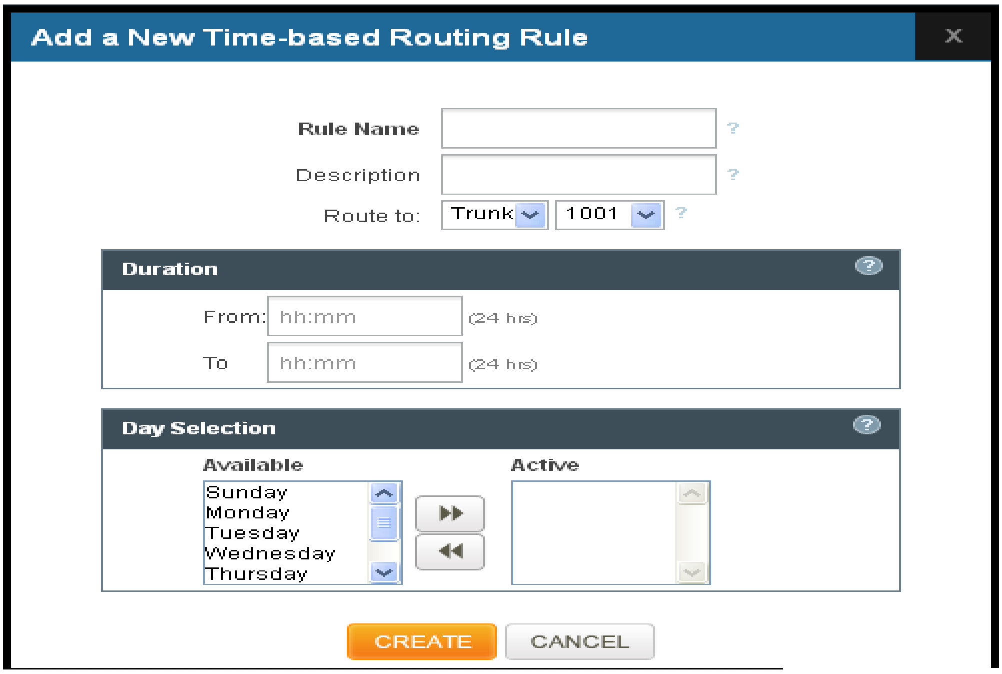
Rule Name: Provide the rule name. It should be unique compared to IVR and Voice file name.

Description: Provide the proper description for the Time based routing rule.

Route To: Configuring the incoming route is setting the destination. The destination for any inbound call to the respective trunks..

Duration: This field let you enter the time range to play the IVR during the days it is Set to play.

Day Selection: This field lets users configure the auto-attendant voice menu to be played on Specific days of the week.



Click on the "**Create**" followed by **"Save all"** button to update in configuration.

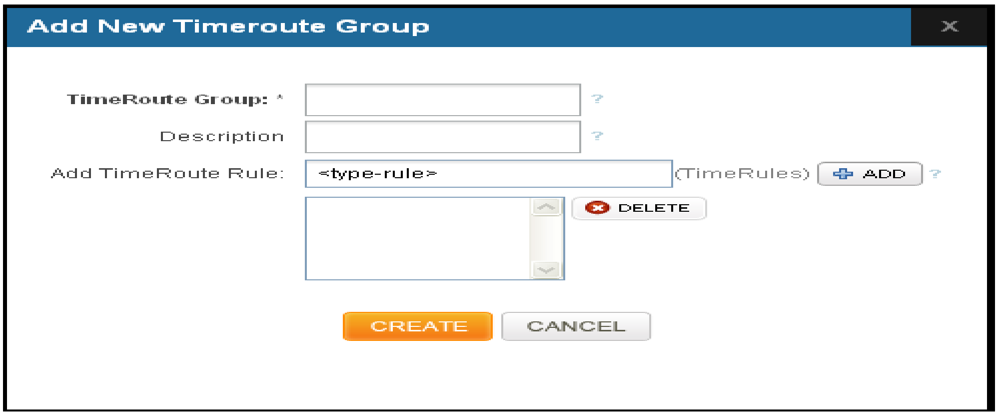
Important Note:

Make sure that the current date and time are configured correctly under **SETUP> Date/Time Configuration**

3.7.2 Add a New Time Route Group:

By clicking on the **SETUP > Time of Day Routing > Add a New Time Route Group** on the left-hand side PRI Gateway menu, we reach this section:

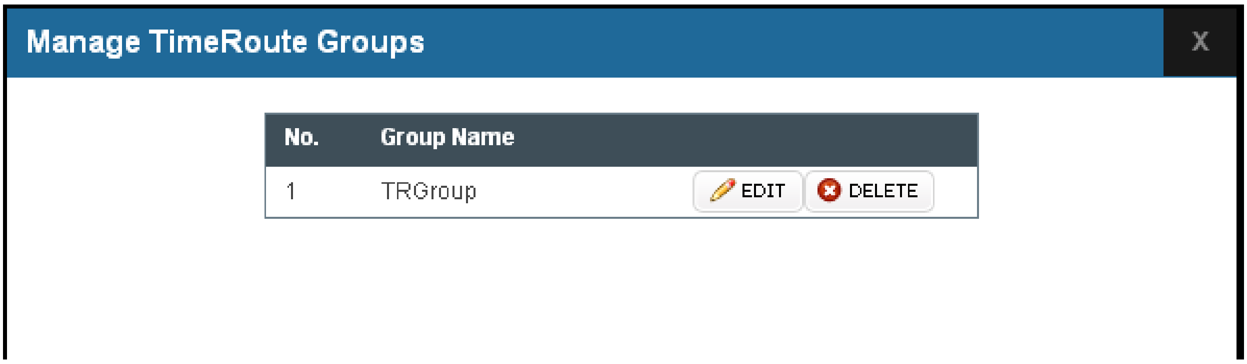
Time route Group: Specify the Time route group name
Description: Provide the proper description for the same
Add Time route rule: type the name of the **"Time of the Day Routing"** rule and click **"ADD"** button



Click on the "**Create**" followed by **"Save all"** button to update in configuration.

3.7.3 Manage Time Route Groups:

Administrator can edit or delete the Manage Time Route group in this configuration page.Click on **"Save "**button, followed by "**Save All**" button to update the configuration changes.



3.8 Network Settings:

The Networking Setting sub menu allows users to configure the LAN-side IP address and DHCP
Server settings, as well as the WAN-side settings like IP address of the WAN port.

By clicking on the **SETUP > Network Settings link** on the top navigation of the PRI Gateway menu, we reach this section:

WAN Configuration: Are the Internet settings of your PRI Gateway.

1. **DHCP**: when enabled and a DHCP server is available, the PRI Gateway will auto configure itself. If DHCP is not available, select "**Static**", and fill in the Network Configuration
2. IP Address: the IP address corresponding to your WAN configuration*
3. Net mask: the Net mask corresponding to your WAN configuration*

4. Gateway: the IP address corresponding to your Gateway*
5. DNS 1: the IP address corresponding to a DNS server*
6. DNS 2: the IP address corresponding to a DNS server*

Important Note:

DHCP mode isn't recommended WAN side. Or trouble may arise when SIP trunk(From Gateway) need to change registration server address caused by revised IP.

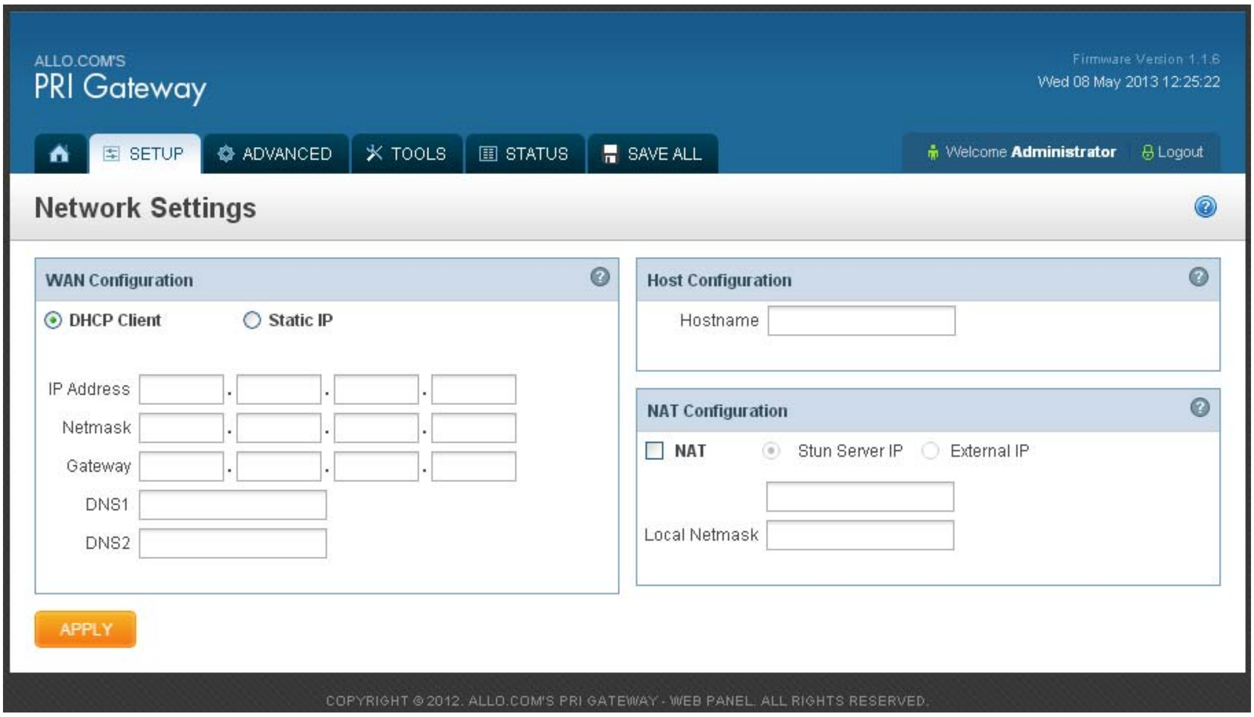
LAN Configuration:

Use this setting in the event that you want to use the PRI Gateway as your network router.

1. **IP Address**: It is a Base IP Address of a LAN Port, which functions as a gateway for its LAN. Default value is 192.168.113.1 (You can log in Web GUI through:192.168.113.2)

Important Note:

WAN port IP and LAN port IP Address shouldn't be in the same network segment.



NAT Configuration:

NAT: NAT option is checked, when the PRI Gateway is behind the Router/Firewall

Stun Server IP: If the PRI Gateway is behind a non-symmetric NAT router, it may be necessary to use STUN to allow PRI Gateway to reliably communicate via IP through the

router. Enter a STUN server IP address or domain name in the STUN Server field. For a list of public STUN servers, please Refer to: http://www.voip-info.org/wiki/view/STUN

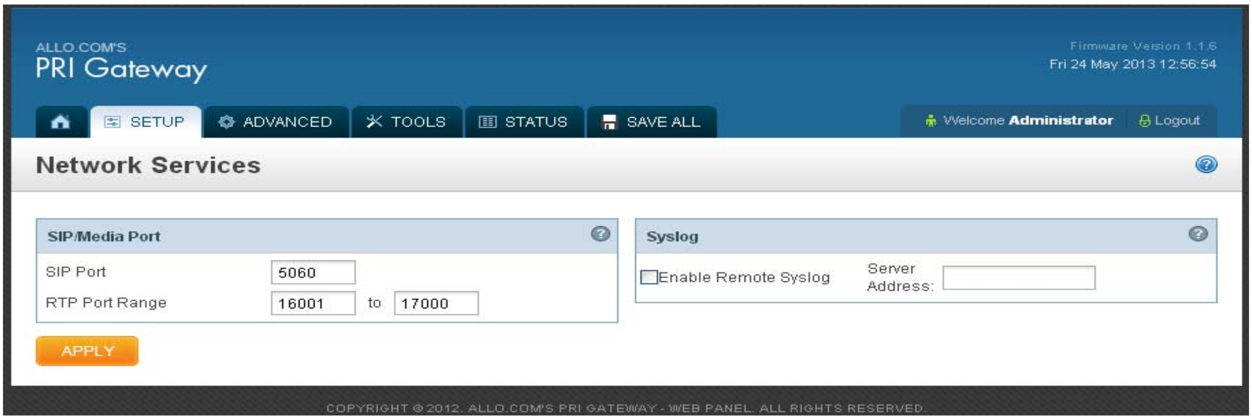
External IP: Enter the NAT Traversal IP address i.e. Public IP Address of your internet , to communicate with Public Network when PRI Gateway is behind the NAT. This IP address will substitute in all outgoing SIP messages instead of Local IP address.

Click on **"APPLY** "button, followed by "**SAVE ALL**" button to update the configuration changes.

3.9 Network Services:

By clicking on the **SETUP** > **Network Services** link on the top navigation of the PRI Gateway menu, we reach this section:

SIP Port: The local listening UDP port for SIP messages. By default 5060
RTP Port Range: PRI Gateway will start listening for media transfer on ports 16001 to 17000. Make sure you configure this dynamic range of ports on your NAT Router. When the PRI Gateway is behind a NAT and the NAT is configured to do port forwarding with above mentioned port range for UDP ports.

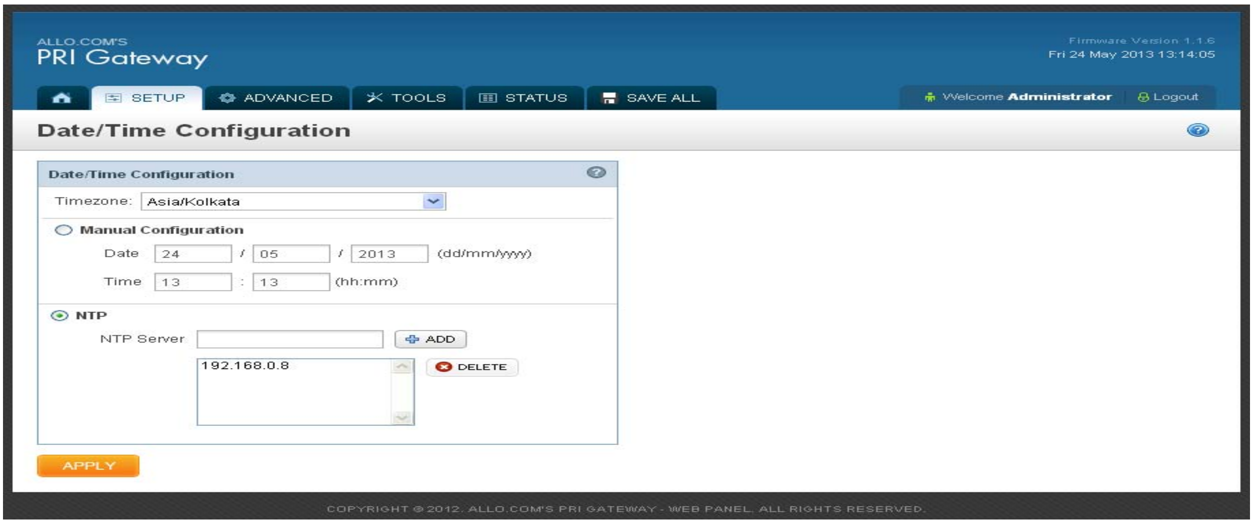


Syslog : Syslog is a standard for logging debug messages. Enter the Syslog server address where a syslog server is running to store the log messages

3.10 Date/Time Configuration:

By clicking on the **SETUP** > **Date/Time Configuration** link on the top navigation of the PRI Gateway menu, we reach this section:

Time Zone: Select the correct time zone for the location where the PRI Gateway is installed using the Time Zone dropdown box.
Manual Configuration: Input the proper date and time.
NTP: URI or IP address of the NTP (Network Time Protocol) server, which will be used by the phone to synchronize the date and time. For Eg: pool.ntp.org

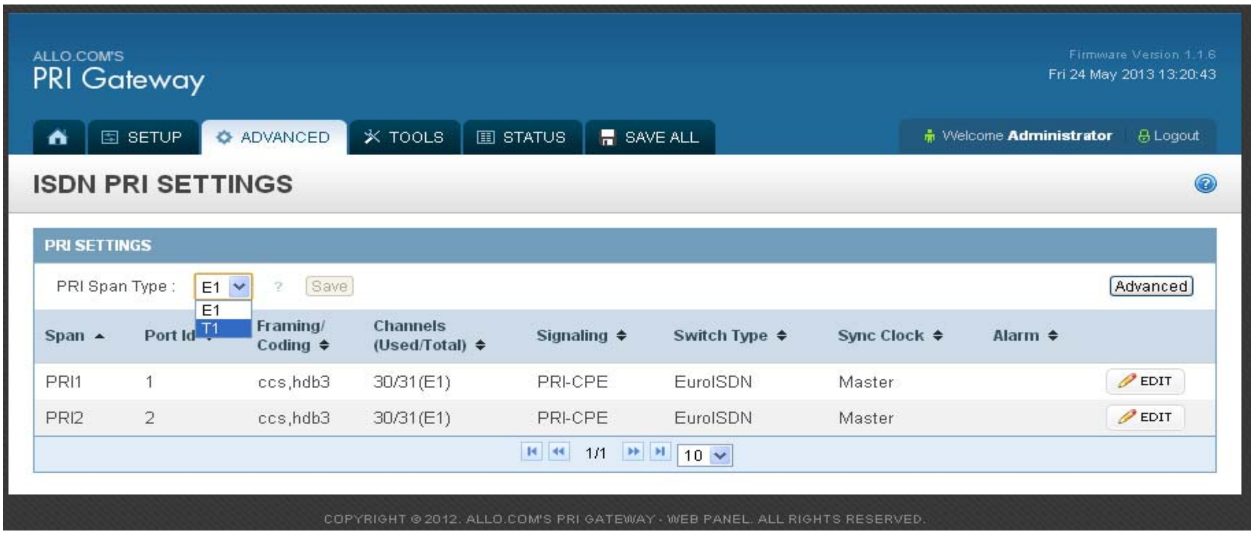


Click on **"APPLY "**button, followed by "**SAVE ALL**" button to update the configuration changes.

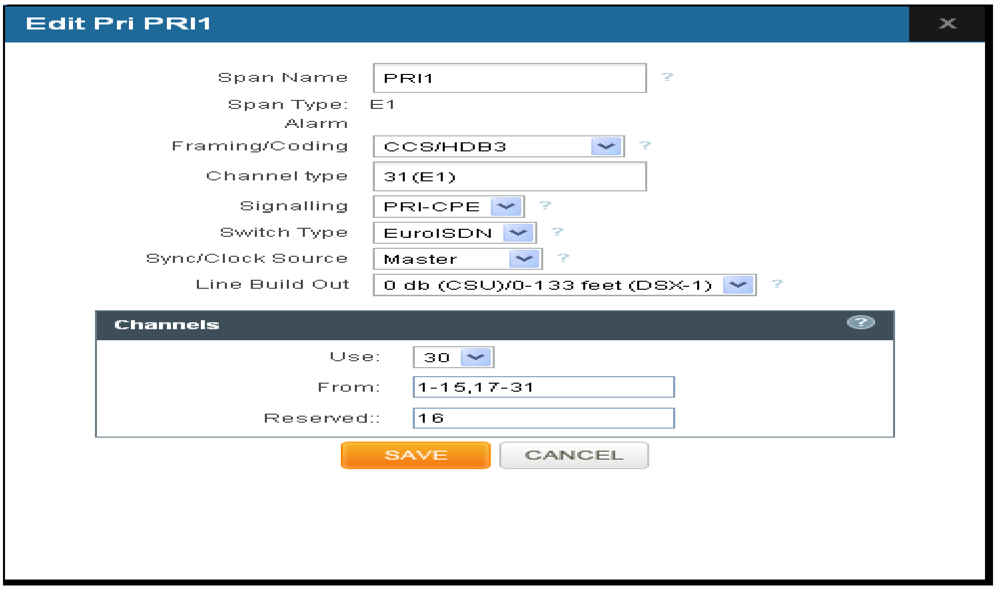
4. Advanced Settings

4.1 ISDN PRI Settings:

PRI SPAN TYPE: Set E1 or T1 as per your Service provider.



By default PRI settings are configured default. You can edit and modify as per your Service providers Signaling parameters.



Framing/ Coding: Select Proper Framing coding by checking with your service Provider. By default for E1: CCS/HDB3. If CRC is enabled from Telco side, Please select CCS/HDB3/CRC4. If not select CCS/HDB3.
By default for T1: ESF/B8ZF

Signaling: By Default its PRI-CPE. In the scenarios like if you want do PRI trunk with other PBX's then you need to select as PRI-NET.

Switch Type: Select the switch type as indicated by the ISDN service provider
By default: E1- Euro ISDN & T1- National ISDN2

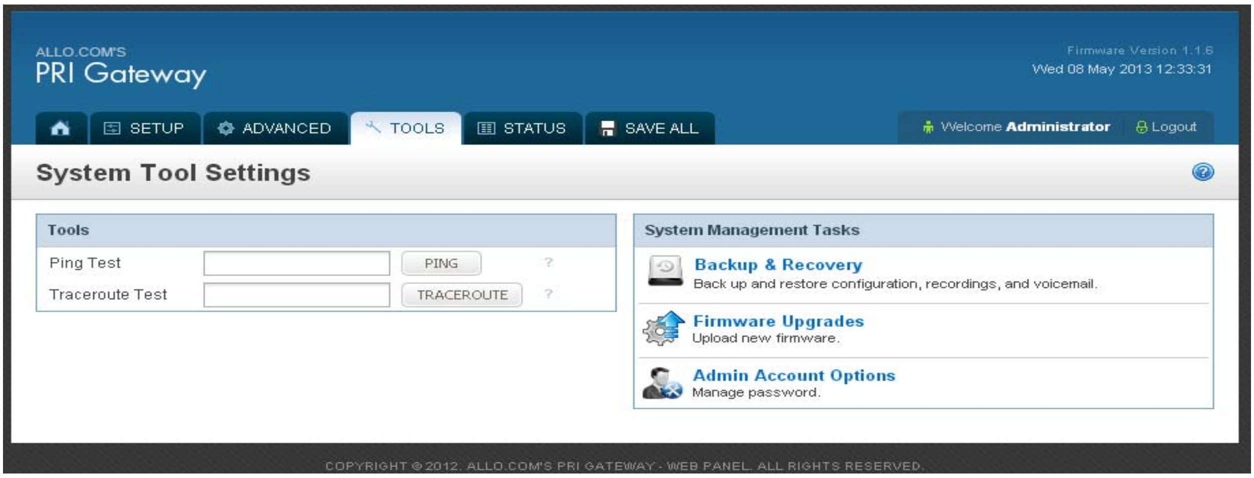
Sync/Clock Source: By default it's Master

Line Build Out: LBO depends on the line length for which attenuation is defined. By default it is 0db. Check with your service provider for appropriate Line build out settings if you face any issue.

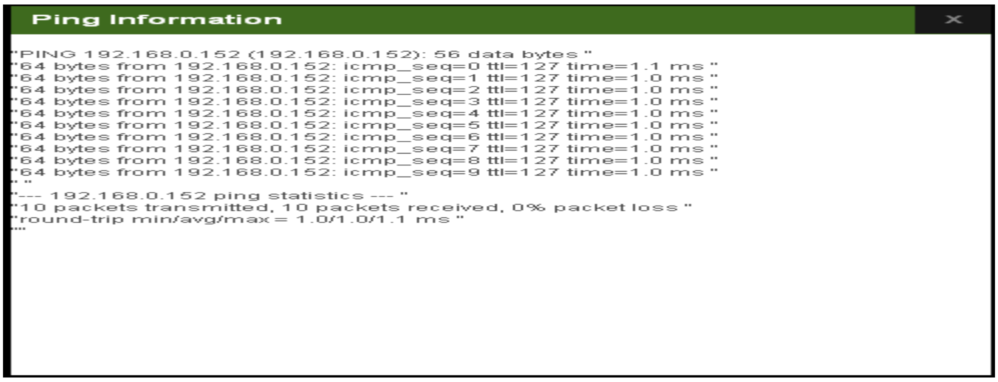
Click on **"SAVE "**button, followed by "**SAVE ALL**" button to update the configuration changes.

5. Tools

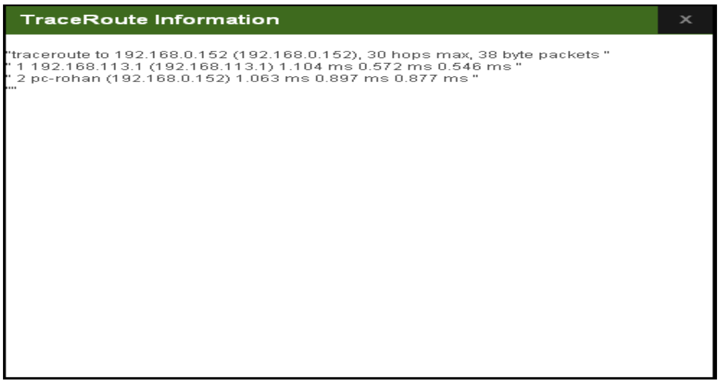
5.1 System Diagnostics



Ping Test: It is used to check the packet loss and latency time from your SIP end client like IP Phone/ FXS gateways to check the quality of your network connections. Enter the ip address of the IP Phone in your LAN and enter " **PING"** Button, it will displays similar to like this:



Trace route Test: It is used to determine the route taken by packets across an IP network.

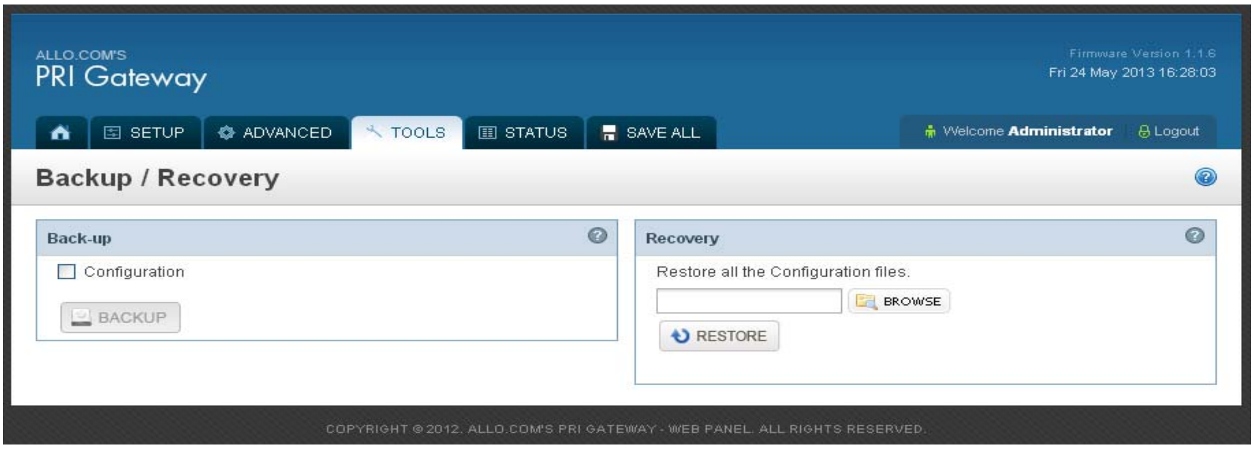


5.2 Backup/Recovery

Navigation: **TOOLS > Backup/Recovery**: Here you can back up or Restore the PRI Gateway Configurations.

1. **Backup Configuration**: Allows you to create a backup of the existing Configuration and Voice files of the PRI Gateway

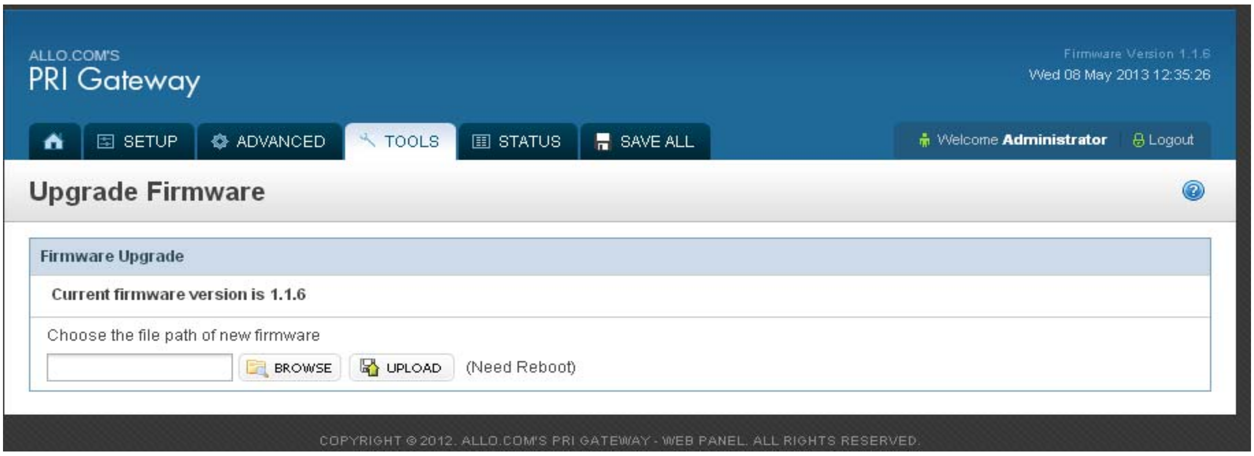
2. **Restore Configuration**: Allow you to upload a backup file to the PRI Gateway, which is restored instantly



5.3 Upgrade Firmware:

The Firmware Upgrade page allows you to update the PRI Gateway with the latest release available, which can contain key updates, added functionalities and bug fixes. When a new

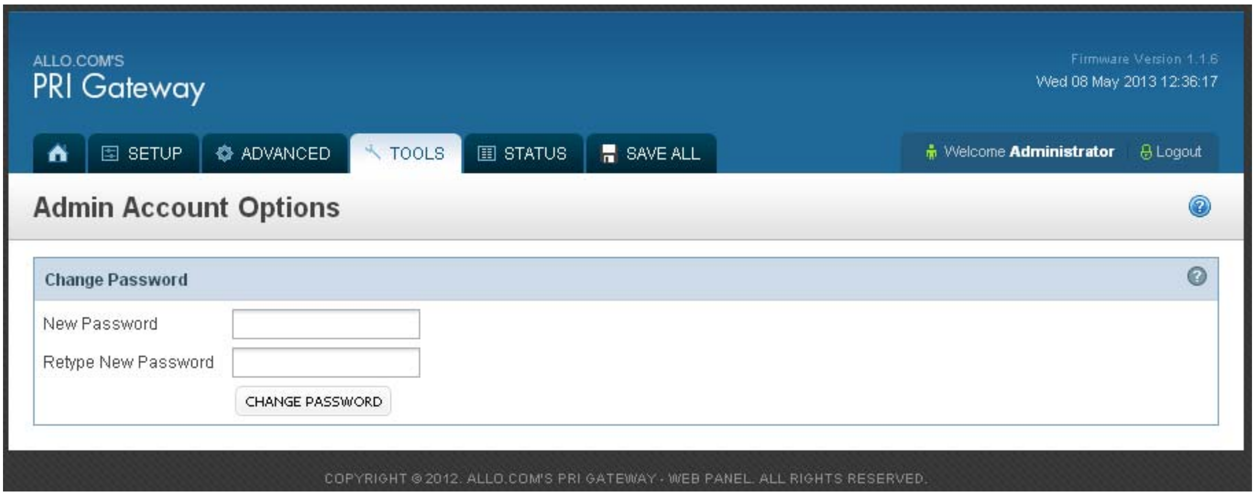
release is available, download it and save to your local PC. Then, browse for the file, and click the Upload button. Now your PRI Gateway will display a Progress Screen and will prompt you when your PRI Gateway is about to reboot. Let your PRI Gateway reboot, and wait for the green LED's to come back on.



Important Note: During firmware upgrade there should not be any power or network disturbances, which may leads to PRI Gateway board faulty.

5.4 Admin Account Options:

Navigation: **TOOLS > Admin Account** Options**:** Here you can change the administrator password Settings



Click on **"CHANGE PASSWORD "**button, followed by "**SAVE ALL**" button to update the configuration changes.

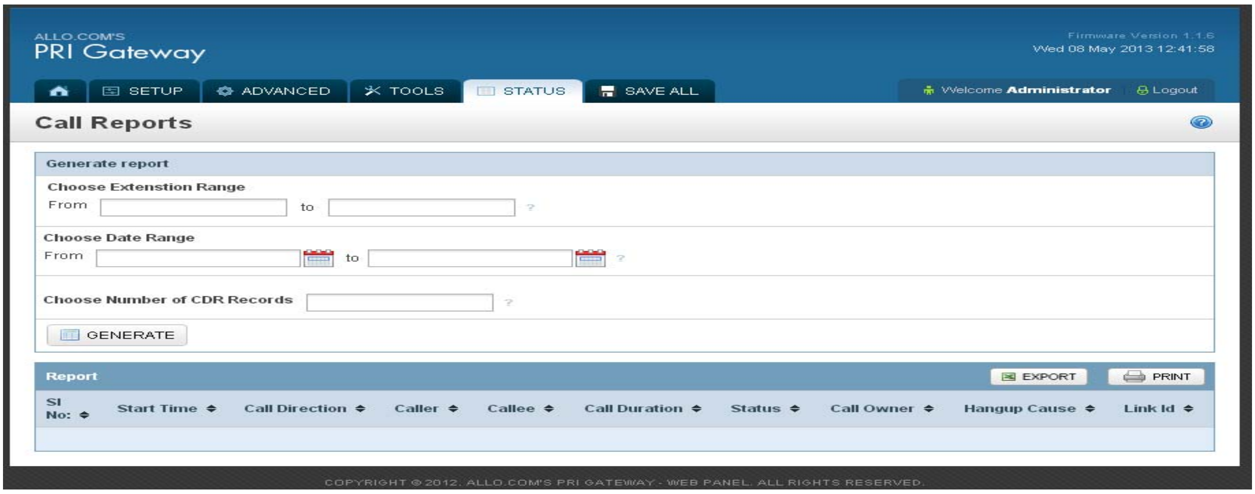
6. Status

6.1 Call Reports:

Navigation: **STATUS > CALL REPORTS** this is where you can generate Call Reports

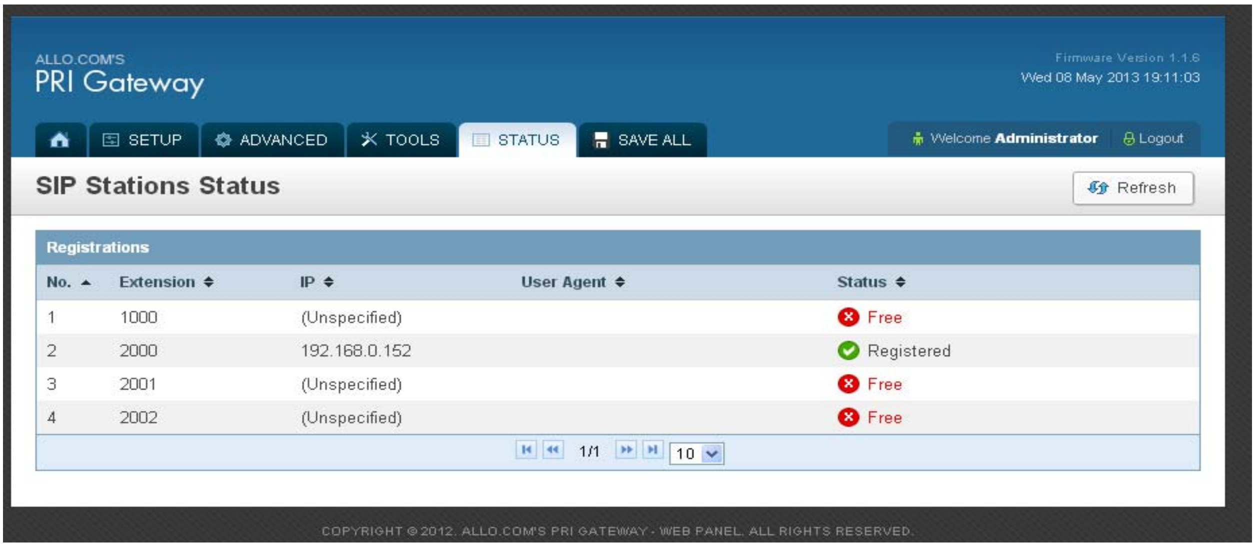
To create a new Report, select the Extension Range or Date range, and click the **"Generate"** Report button. A list with call details will display in the Call Reports section.

You can either export to your local PC or Print the Call reports.



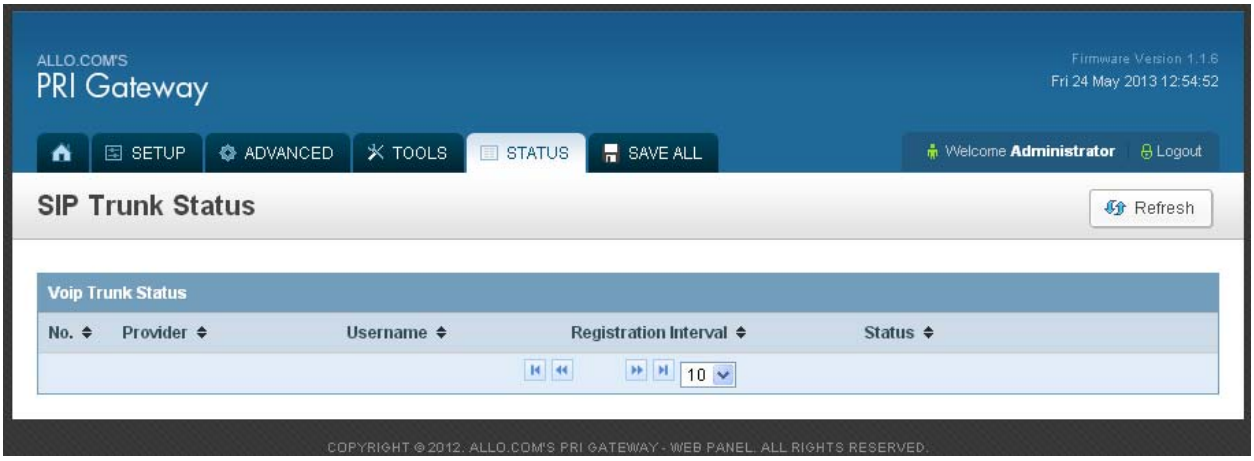
6.2 SIP Station Status:

Navigation: **STATUS > SIP STATION STATUS** this is where you can find the SIP Station status



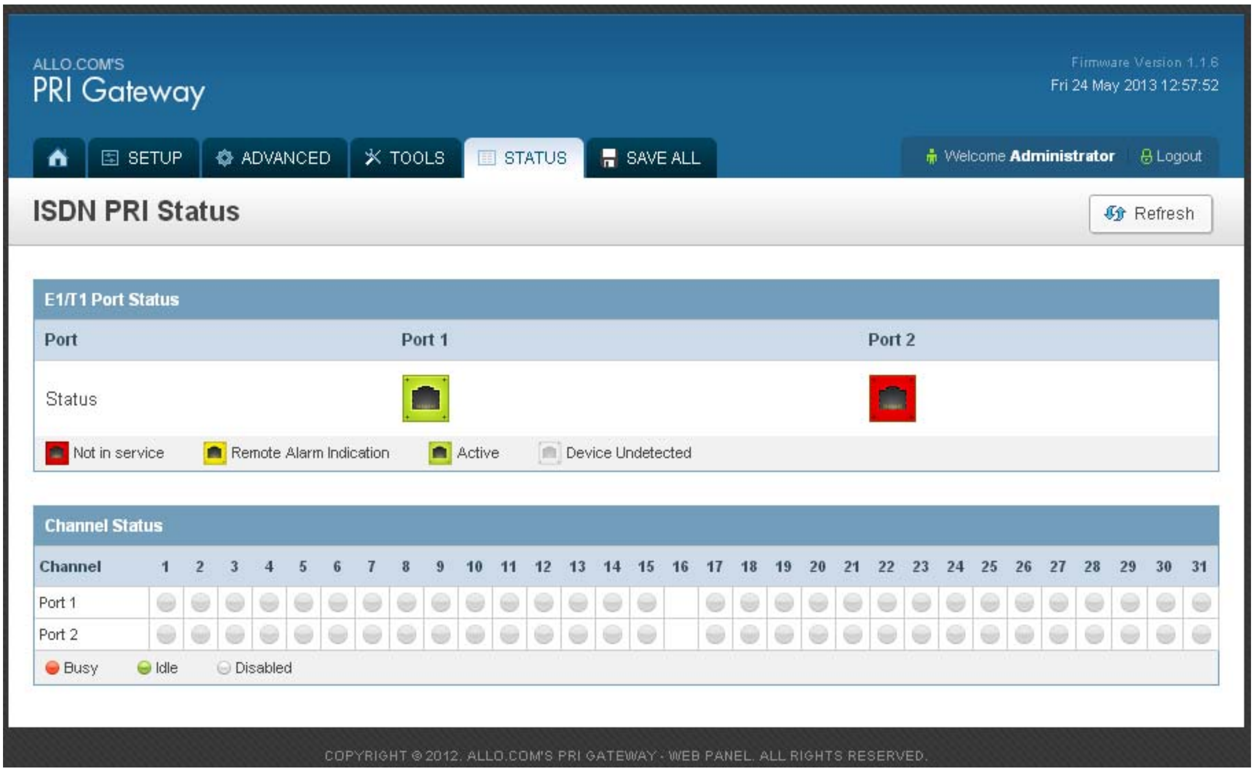
6.3 SIP Trunk Status:

Navigation: **STATUS > SIP TRUNK STATUS** this is where you find the status of SIP Trunk Status

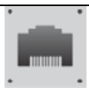


6.4 ISDN PRI Status:

Here you can see the status of the E1/T1 Port and Channel Status.



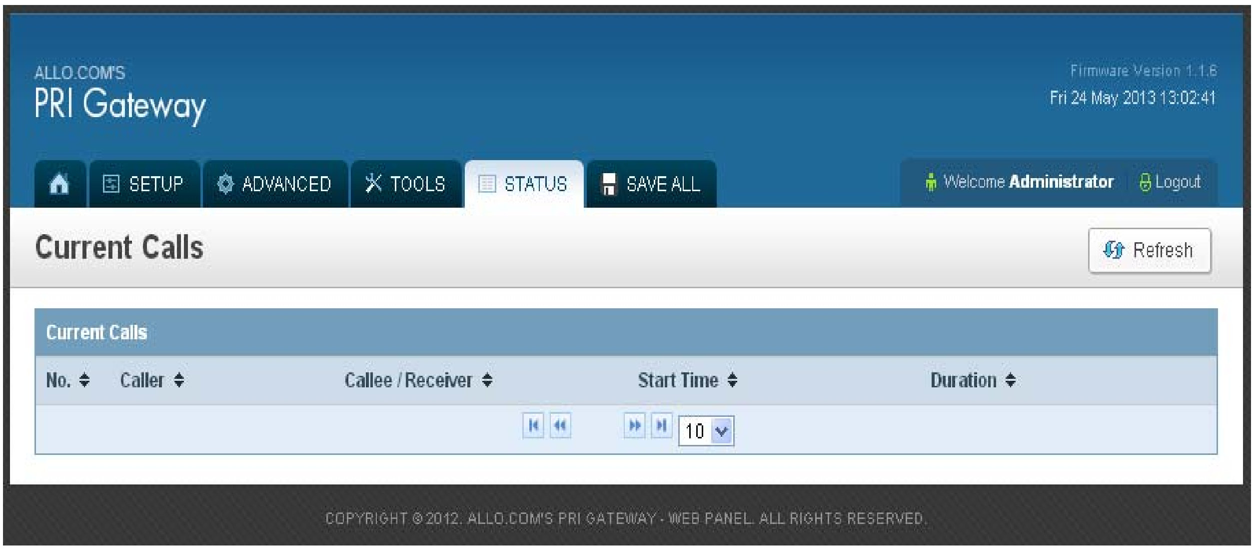
E1/T1 Port Status	Description

	Appliance is not seeing far end, circuit is not up, or cable is bad.
	Appliance is synchronizing or is receiving a yellow alarm from the far end.
	PRI Link is Active. Appliance is in-sync with the far end.
	T1/E1 driver is not initialized.

PRI Channel Status	Description
	Channel is Busy
	Channel is Idle and ready to receive or make calls
	Channel is not active

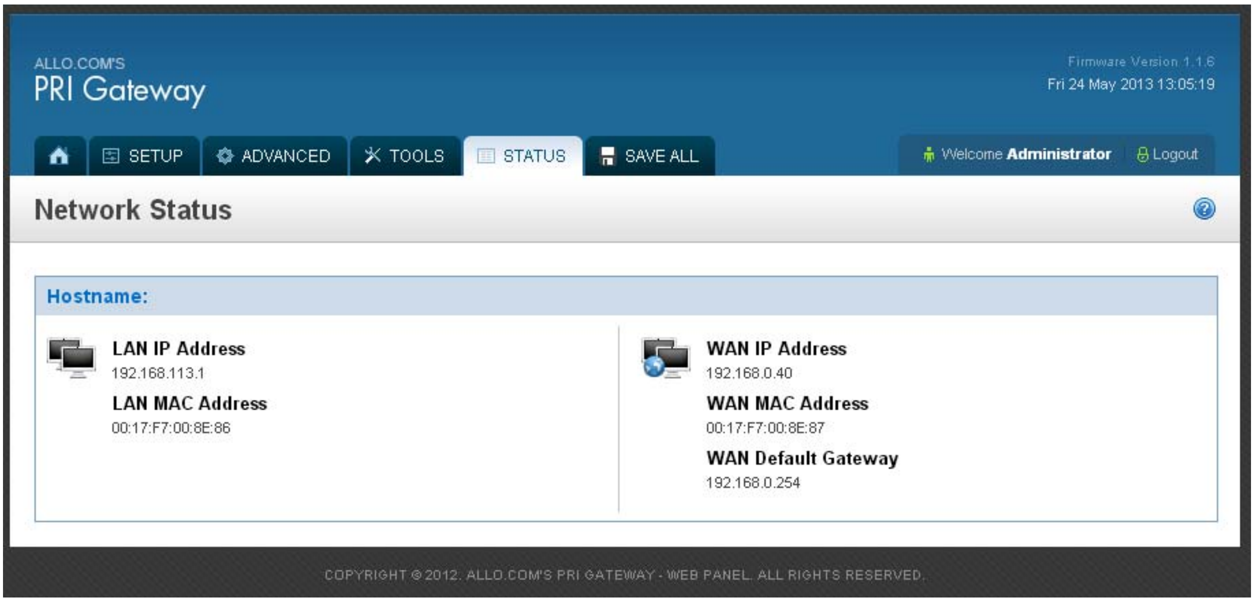
6.5Current Calls:

Navigation: **STATUS > Current Calls/Conferences:** This is where you can find the active calls



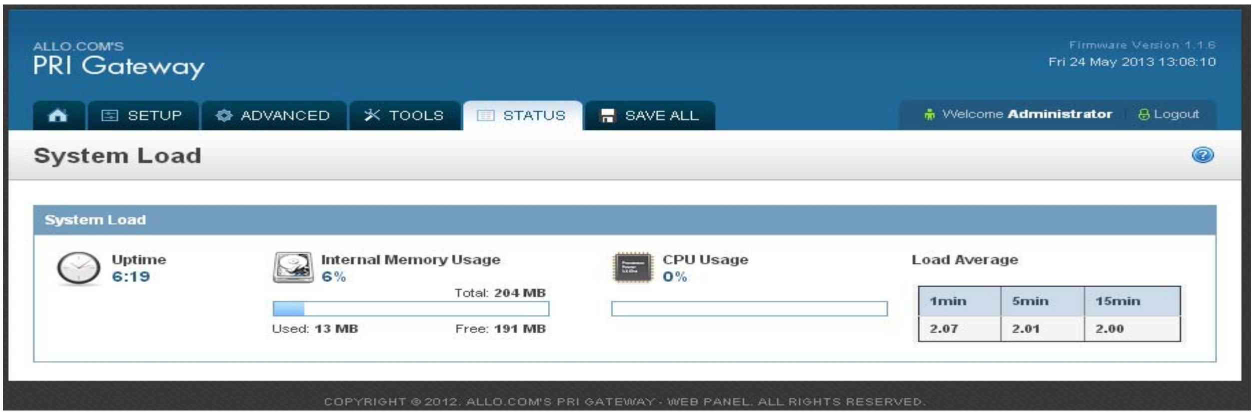
6.6 Network Status

Navigation: **STATUS > Network Status:** This is where you can find the LAN and WAN ip address and MAC Addresses.



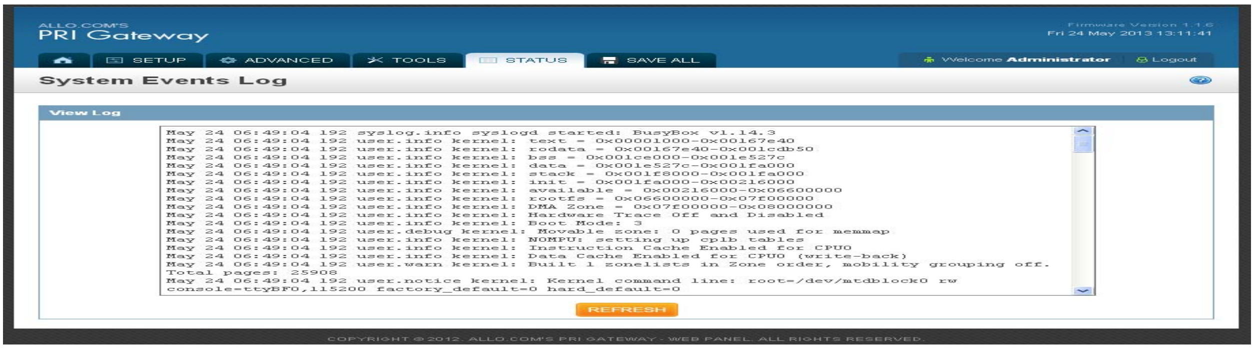
6.7 System Load

The **System Info** tool displays a lot of useful information and statistics on our server, , Internal& External Memory usage and system uptime.



6.8 System Events Log

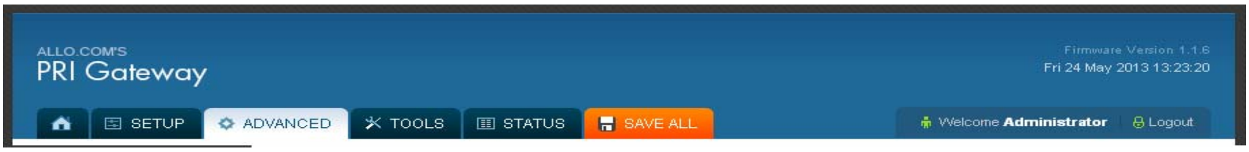
You can view the System event log such as SIP and ISDN PRI Signaling messages, which is useful for debugging.



7. Save All

Navigation: **SAVE ALL**

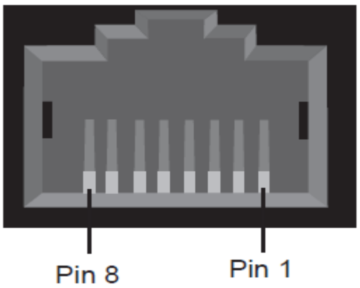
This is the button which you must press after adding / editing / deleting configurations such as Extensions, SIP Trunk, ISDN PRI Settings
etc



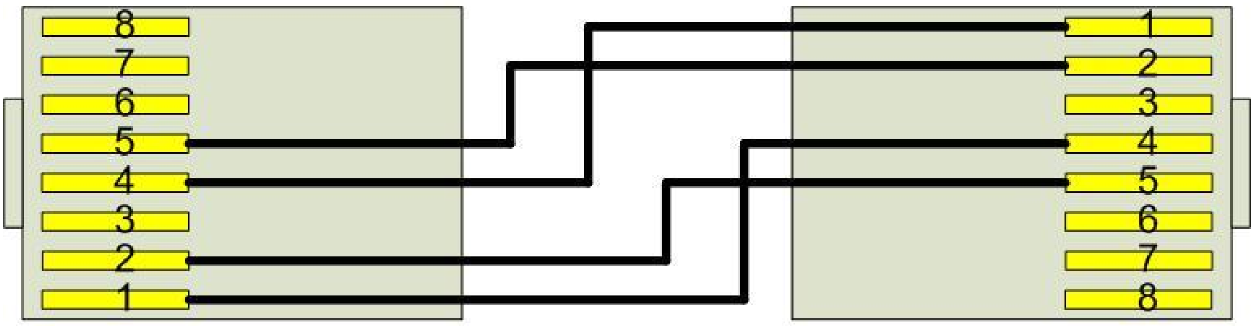
8. Appendix A

Pin Assignments:

All RJ45 (8P8C) ports labeled T1/E1 on the Gateway Series appliance are 8-pin. RJ45 jacks are also commonly referred to as RJ48 when used for telecommunication. The pin assignments are identified in below table.

	Pin	Description
	1	Rx Ring
	2	Rx Tip
	3	Unused
	4	Tx Ring
	5	Tx Tip
	6	Unused
	7	Unused
	8	Unused

PRI CROSS OVER CABLE



1 <-> 4
2 <-> 5
4 <-> 1
5 <-> 2

9. Appendix B: Glossary and Acronyms

DS0 *Digital Signal, Level 0*
A voice grade channel of 64 kbps. The worldwide standard speed for Digitizing voice conversation using PCM (Pulse Code Modulation).

DTMF *Dual Tone Multi-Frequency*
Push-button or touch tone dialing.

E1
The European equivalent of North American T1, transmits data at 2.048 Mbps, up to 32 channels (DS0s).

E3
The European equivalent of North American T3, transmits data at 34.368 Mbps, up to 512 channels (DS0s). Equivalent to 16 E1 lines.

EMI *Electromagnetic Interference*
Unwanted electrical noise.

Full duplex
Data transmission in two directions simultaneously.

FXS *Foreign Exchange Station*
Initiates and sends ringing voltage. Phones are connected to FXS ports.

G.711
A recommendation by the Telecommunication Standardization Sector (ITU-T) for an algorithm designed to transmit and receive ulaw PCM voice and A-law at a digital bit rate of 64 kbps.

G.723.1
A recommendation by the Telecommunication Standardization Sector (ITU-T) for an algorithm designed to transmit and receive audio at 6.3 kbps or 5.3 kbps.

G.729a
A recommendation by the Telecommunication Standardization Sector (ITU-T) for an algorithm designed to transmit and receive audio at 8 Kbps

HDLC *High-Level Data Link Control*
A bit-oriented synchronous data link layer protocol developed by the International Organization for Standardization (ISO).
iLBC *internet Low Bit rate Codec*
A free speech codec used for voice over IP. It is designed for narrow band speech with a payload bit rate of 13.33 kbps (frame length = 30ms) and 15.2 kbps (frame length = 20ms).

PBX *Private Branch Exchange*
A smaller version of a phone company's large central switching office. Example: Asterisk.

POTS *Plain Old Telephone Service*
The public switched telephone network (PSTN) is the network of the world's public circuit-switched telephone networks. Originally a network of fixed-line analog telephone systems, the PSTN is now almost entirely digital, and now includes mobile as well as fixed telephones.

PPP *Point-to-Point Protocol*
Type of communications link that connects a single device to another single device, such as a remote terminal to a host computer.

PRI
Primary Rate ISDN

PSTN *Public Switched Telephone Network*
A communications network which uses telephones to establish connections between two points. Also referred to as the dial network.

PTMP *Point-to-Multipoint*
A connection where data is broadcast between more than two endpoints.

PTP *Point-to-Point*
A connection restricted to two endpoints.

RJ11
A six-pin jack typically used for connecting telephones, modems, and fax machines in residential and business settings to PBX or the local telephone CO.

RJ45
8P8C, un-keyed modular connector type for Ethernet over twisted pair. Predominantly used in LAN and uses Unshielded Twisted Pair cable.

RJ48
8P8C modular connector type for T1 and ISDN termination over twisted pair. While RJ45 and RJ48 use the same connector, they differ in their wiring. RJ48 is commonly seen on T1 lines and uses Shielded Twisted Pair cable.

SIP *Session Initiation Protocol*
An IETF standard for setting up sessions between one or more clients. It is currently the leading signaling protocol for Voice over IP, gradually replacing H.323.

T1
A dedicated digital carrier facility which transmits up to 24 voice channels (DS0s) and transmits data at 1.544 Mbps. Commonly used to carry traffic to and from private business networks and ISPs.

VoIP *Voice over Internet Protocol*
Technology used for transmitting voice traffic over a data network using the Internet Protocol.

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Our technical support Engineers are ready to answer all of your queries. Kindly submit a trouble ticket online to receive in-depth support.

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